

Students
First!

EXAMINERS' REPORT

JANUARY

1991

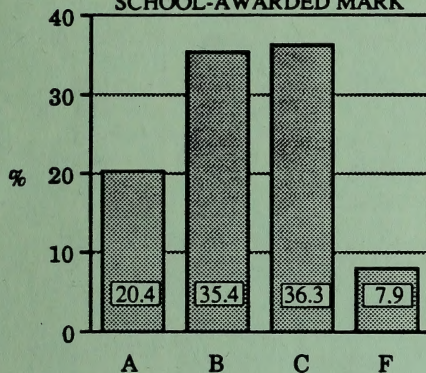
Student Evaluation

CANADIANA

Biology 30 Diploma Examination Results

APR - 3 1991

SCHOOL-AWARDED MARK

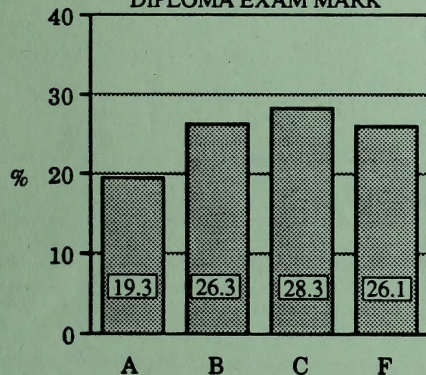


The summary information in this report provides teachers, school administrators, students, and the general public with an overview of results from the January 1991 administration of the Biology 30 Diploma Examination. The information is most helpful when used in conjunction with the detailed school and jurisdiction reports that have been mailed to schools and school jurisdiction offices. An annual provincial report containing a detailed analysis of the combined January, June, and August results will be available by the end of 1991.

DESCRIPTION OF THE EXAMINATION

The Biology 30 Diploma Examination consists of two parts: a multiple-choice section of 70 questions worth 70% and a written-response section of seven questions worth 30%.

DIPLOMA EXAM MARK

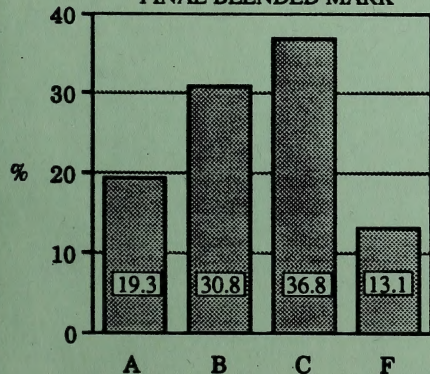


ACHIEVEMENT OF STANDARDS

The information reported is based on the final blended marks achieved by 8 630 students who wrote the January 1991 examination.

- 86.9% of these students achieved the acceptable standard (a final blended mark of 50% or higher).
- 19.3% of these students achieved the standard of excellence (a final blended mark of 80% or higher).

FINAL BLENDED MARK



PROVINCIAL AVERAGES

- The average school-awarded mark was 66.8%.
- The average diploma examination mark was 62.2%.
- The average final blended mark, representing an equal weighting of the diploma examination and school-awarded marks, was 64.9%.

SUBTEST RESULTS

When analysing any detailed examination results, please bear in mind that subtest results cannot be directly compared. Results are in average raw scores.

Machine scored: 46.1 out of 70

Written response: 16.0 out of 30

- Course Content
 - Cellular Processes: 5.8 out of 9
 - Homeostatic Mechanisms: 2.7 out of 4
 - Nutrition and Digestion: 7.3 out of 14
 - Body Fluids: 9.2 out of 15
 - Breathing, Gas Exchange, and Transport: 4.6 out of 7
 - Energy Release: 3.3 out of 5
 - The Kidney: 6.2 out of 10
 - Regulation of the Internal Environment: 13.6 out of 22
 - Voluntary Movement and Body Support: 2.6 out of 4
 - Human Reproduction: 6.8 out of 10
- Process Skills: 20.5 out of 37
 - Multiple-choice questions 3, 5, 11, 15, 29, 31, 34, 36, 50, 55, 56, and 70, and written-response questions 1, 2, 3, 4, 6, and 7.
- Cognitive Levels
 - Knowledge: 16.8 out of 25
 - Comprehension and Application: 33.2 out of 55
 - Higher Mental Activities: 12.2 out of 20

EXAMINATION BLUEPRINT

Each question on the examination is classified in two ways: according to the curricular content area being tested and according to the cognitive level demanded by the question. The examination blueprint illustrates the distribution of questions in January 1991 according to these classifications. Numbers with square brackets [] indicate written-response questions, and those without brackets indicate multiple-choice questions.

Reporting Category	Questions by Cognitive Level			Examination Emphasis (%)
	Knowledge	Comprehension and Application	Higher Mental Activities	
Cellular Processes	4, 6	1, 2, 3, [1]	5	9
Homeostatic Mechanisms		7	[4]	4
Nutrition and Digestion	8, 9, 12, 13, 14	10, [2]	11, 15	14
Body Fluids	16, 19, 22, 23	17, 18, 20, 21, 24	[3]	15
Breathing, Gas Exchange, and Transport	25, 26	27, 28, 30, 31	29	7
Energy Release	32	33, 34, 35	36	5
The Kidney	37, 39	38, 40, 41, 42, 43, [7]		10
Regulation of the Internal Environment	44, 47, 51, 52, 54	45, 46, 48, 49, 53, [5], [6]	50, 55, 56	22
Voluntary Movement and Body Support	57	58, 59, 60		4
Human Reproduction	61, 63, 69	64, 65, 66, 67	62, 68, 70	10
Examination Emphasis (%)	25	55	20	100

RESULTS and EXAMINERS' COMMENTS

The examination has a balance of question types and difficulties. It is designed so that students capable of achieving the acceptable standard would obtain a mark of 50% or higher and students achieving the standard of excellence would obtain a mark of 80% or higher. This examination is parallel in structure to the 1990 Biology 30 examinations and produced a similar distribution of letter grades (compare Figure 2-15 of the *Annual Report, Diploma Examinations Program, School Year 1989-90*). The number of students who received blended marks in Biology 30 this January in comparison to January 1990 increased by 6.4%. Approximately 14.4% of the students who wrote the Biology 30 Diploma Examination in January 1991 had also written at least one Biology 30 diploma examination in 1990. This subpopulation (1 247) achieved an examination mean that was three per cent lower than the mean achieved by the total population (8 630).

Students who were successful on the examination demonstrated a clear understanding of biology concepts that goes beyond rote memorization and recall of textual material.

MULTIPLE CHOICE

QUES.	KEY	DIFF.*	QUES.	KEY	DIFF.	QUES.	KEY	DIFF.	QUES.	KEY	DIFF.	QUES.	KEY	DIFF.
1	D	78.9	15	D	39.4	29	A	85.7	43	B	56.4	57	B	89.1
2	D	68.0	16	B	55.4	30	A	69.7	44	B	74.8	58	D	76.1
3	A	70.8	17	C	77.9	31	B	38.9	45	C	75.3	59	B	37.6
4	B	58.0	18	C	46.7	32	A	63.7	46	A	55.1	60	C	60.3
5	A	57.3	19	C	77.6	33	A	64.3	47	A	70.8	61	A	71.8
6	D	66.3	20	B	75.6	34	C	49.8	48	C	77.1	62	C	55.5
7	C	69.9	21	C	59.3	35	D	83.6	49	C	71.2	63	B	61.1
8	B	56.1	22	B	60.1	36	C	70.0	50	B	67.4	64	C	80.8
9	A	74.4	23	D	64.4	37	D	57.9	51	B	77.8	65	A	66.3
10	C	53.4	24	A	65.4	38	B	72.7	52	D	60.3	66	A	79.4
11	C	79.1	25	C	77.8	39	A	60.2	53	C	63.3	67	C	73.1
12	D	43.0	26	A	68.7	40	D	77.5	54	D	64.6	68	D	66.1
13	A	82.7	27	D	77.4	41	B	70.7	55	A	47.5	69	B	69.4
14	B	74.7	28	D	41.9	42	D	72.9	56	A	56.5	70	A	51.3

*Difficulty - percentage of students answering the question correctly

MULTIPLE CHOICE (continued)

Students who achieved the acceptable standard demonstrated an understanding of key biological terms by identifying appropriate applications and examples (questions 1, 4, and 32). These students could associate diagrammatic representations of body structures with their corresponding functions (questions 10, 24, and 49). They also had sufficient understanding of biological concepts to identify logical descriptions of cause-and-effect relationships (questions 30, 43, and 65).

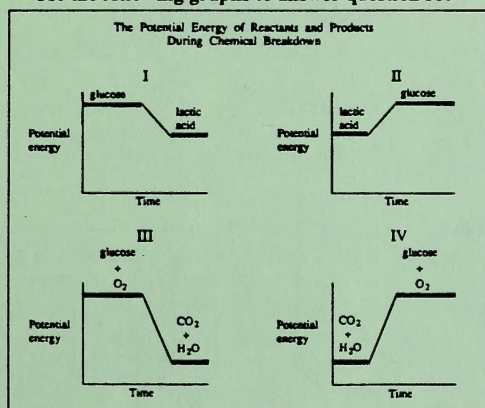
Students who achieved the standard of excellence demonstrated the ability to interpret complex experimental data (questions 5, 55, and 70). They also could analyse an investigative apparatus and then identify parallels between its operation and the functions of the human body (questions 31 and 34).

Detailed comments follow on three questions, presented in the order of increasing cognitive level.

37. The function of the proximal tubule of the nephron is to

- A. initiate the formation of urea
- B. filter material from the blood
- C. reabsorb urea into the blood
- *D. return material to the blood

Use the following graphs to answer question 33.



33. The graphs that illustrate aerobic and anaerobic respiration respectively are

- *A. III and I
- B. III and II
- C. IV and I
- D. IV and II

Use the following information to answer question 56.

Many drugs influence autonomic nervous functions. The table describes the action of four drugs.

Drug	Action
Ephedrine	stimulates release of noradrenaline from sympathetic nerve endings
Reserpine	inhibits sympathetic activity by preventing the synthesis of noradrenaline
Neostigmine	blocks the action of cholinesterase at neuromuscular junctions
Pilocarpine	produces parasympathetic effects

56. Which drug would cause an increase in blood pressure?

- *A. Ephedrine
- B. Reserpine
- C. Neostigmine
- D. Pilocarpine

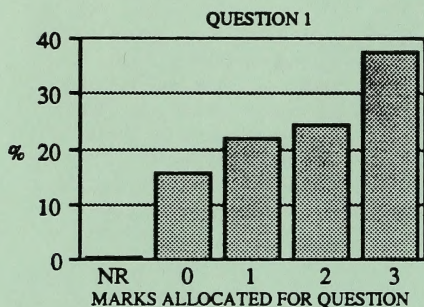
Question 37 required students to know which part of the nephron is named proximal tubule and then to recall its specific function. In order to identify the correct answer, however, students had to understand the difference between filter and reabsorb, as well as between urea and urine. This clarity of knowledge distinguished those students who achieved the standard of excellence (A) from those who did not achieve the acceptable standard (F). Of the students who obtained an A on the examination, 92.6% selected the correct response, whereas only 25.6% of the students who obtained an F selected the correct response.

Question 33 required students to recall the meaning of key biological terms, to distinguish between chemical reactants and products, and to interpret graphs that depicted changes in potential energy. This multistep process-skill question was correctly answered by 92.4% of the students who achieved the standard of excellence (A) on the examination. Of the students who obtained a B or C level of achievement, 67.7% selected the correct answer, whereas only 36.5% of the students who failed the examination selected the correct answer. Many students did not understand the difference between reactants and products, and therefore chose graphs that depicted the chemical sequence in reverse. Other students confused the changes in potential energy over time with the relative amounts of energy released by anaerobic versus aerobic respiration, and chose a pair of graphs that were opposite in the direction of energy change.

Question 56 required students to recall the major factors that directly determine blood pressure (heart action, vessel size). Next they had to analyse the data provided about the drugs so as to determine each drug's effect on the components of the autonomic nervous system. It was then necessary to determine how the drug-induced changes in the nervous system would affect heart action and/or vessel size. Finally, selection of a drug that would increase blood pressure could be made. This multistep problem was solved correctly by 83.1% of the students who achieved the standard of excellence (A) on the examination, whereas 56.9% of the students who obtained a B or C level of achievement solved it correctly and only 35.9% of the students who failed the examination selected the correct answer.

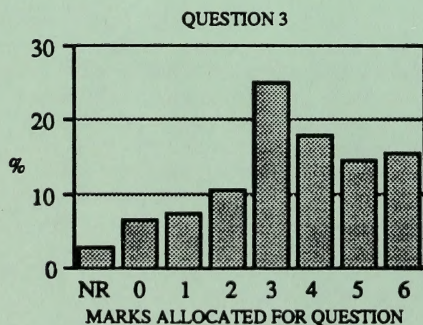
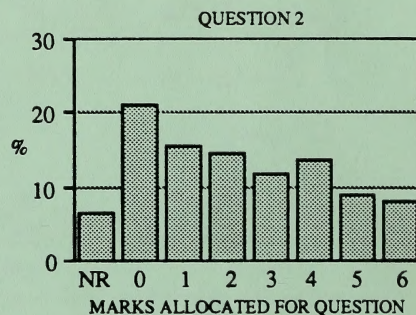
WRITTEN RESPONSE

The seven questions in the written-response section are designed to measure achievement on seven of the 10 content strands for Biology 30. All the questions went beyond measuring simple recall of information. Questions 1 and 2 required students to analyse laboratory investigations, and questions 3 and 5 required students to integrate concepts from two content strands. Questions 4 and 6 required students to interpret graphs, evaluate conclusions, and form generalizations. Question 7 required students to explain a common societal situation in terms of physiological processes. The overall quality of student responses showed some improvement in comparison to the responses on the 1990 January and June examinations. The average percentage of no responses was approximately 2.4, a significant decrease from 3.7 for January and June 1990.



Question 1: Most students identified the correct diagrams for all three parts of the question, but approximately 62% gave incomplete explanations to support their choices. Good explanations were given for distilled water, but many students inaccurately explained hypertonic and isotonic solutions. These students confused the concept of concentration with amount. Another common misconception was that salt enters the cell and pushes water out. Some students did not describe both solutions (beaker/cell) when providing comparisons. On this 3-mark question, the average mark was 1.84 for 61% of the available mark.

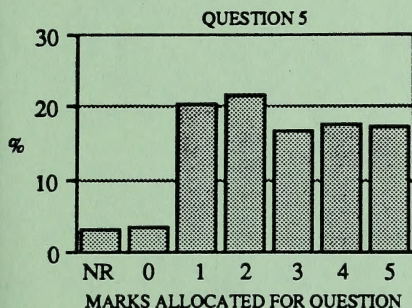
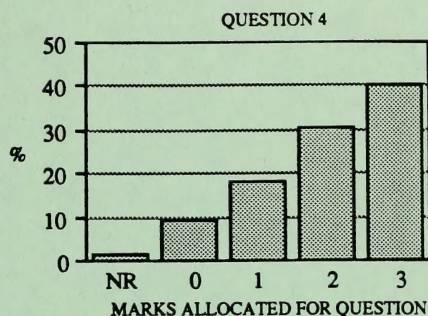
Question 2: The fact that this question proved to be the most difficult in the written-response section indicates that the students did not understand chemical digestion from a laboratory perspective. Most students understood that pepsinogen "works" best in an acidic environment and that bile "helps" in fat digestion, but precise explanations and correct procedures for little or no chemical digestion were either inaccurate or absent. Many students thought that distilled water (diluted the enzyme) or heat (denatured the enzyme) prevented chemical digestion. Some students did not recognize the category of food present (egg white/protein, olive oil/lipid). Many students said identification reagents such as Benedict's solution should be added to bring about chemical digestion. On this 6-mark question, the average mark was 2.28 for 38% of the available mark.



Question 3 generated student responses that reflected a level of understanding above what was expected. Most students could easily identify two significant differences between the two circulatory patterns. Many students then went on to describe the functional implications of the structural differences. It was at this point that misconceptions and weak communication skills became evident. Some students stated that the mother or the placenta pumps blood for the fetus. Others stated that the mother produces blood for the fetus and therefore the mother and fetus share the same blood. Many students limited their descriptions to one of the two circulatory systems and therefore failed to make meaningful comparisons. Too many students presented general functional differences without relating them specifically to the structural differences (newborn uses its lungs). Nevertheless, it should be noted that 30% of the students achieved the standard of excellence on this question. On this 6-mark question, the average mark was 3.40 for 57% of the available mark.

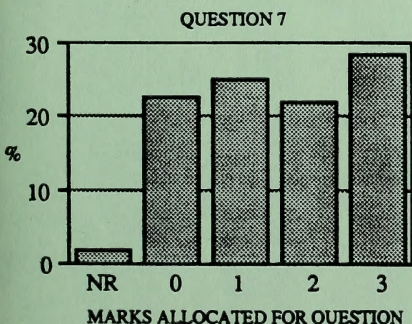
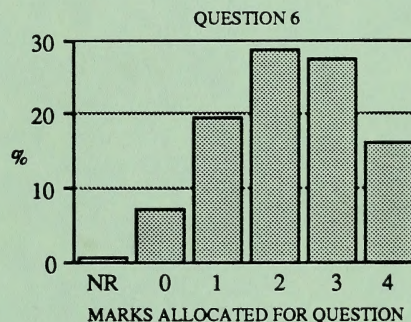
WRITTEN RESPONSE (continued)

Question 4 was well answered by many students (40.1%). Most students easily recognized that statements a and c were supported by the data presented and that statement b, although true, was neither supported nor negated. Some students restated the assertions instead of using data from the graph to support them. Some students did not seem to understand the meaning of "alkalinity" or "optimal activity." On this 3-mark question, the average mark was 1.99 for 66% of the available mark.



Question 5: Most students understood the format of this question and therefore attempted to complete the chart. Students who achieved the standard of excellence on the examination obtained a mean score of 4.26 out of 5 marks (85%) on this question. Students who did not achieve the acceptable standard obtained a mean score of 1.33 (27%). These students did not understand the significance of diagrams I and II and therefore interchanged hormones and enzymes. They also named substances that are secreted by organs other than the pancreas (small intestine). Some students did not observe the level of specificity indicated by the examples and so gave general answers (pancreatic juice, insulin controls blood sugar). On this 5-mark question, the average mark was 2.70 for 54% of the available mark.

Question 6: Students who obtained a zero mark for part a of this question either did not include the correct unit with their numerical answer or interpreted the vertical axis as presenting a multiplicative increase rather than an additive increase in the number of decibels (20 x instead of 20 dB). Many students had difficulty in accurately communicating their generalization for part b. Because of the sentence syntax or choice of vocabulary, the opposite meaning to what the writer most likely intended was given. Most students identified a manipulated variable represented by the data, but many did not identify or correctly describe the responding variable. On this 4-mark question, the average mark was 2.25 for 56% of the available mark.



Question 7: Many students obtained a maximum of one mark for this question because they focused on the increase in liquid consumption rather than on the depressant effects of alcohol. Furthermore, these students did not understand the concepts of reabsorption and concentration in reference to water. Too many students discussed changes in concentration of urine in terms of acidity, color, or volume. The students who achieved the standard of excellence on the examination, however, obtained a mean score of 2.62 out of 3 marks (87%). On this 3-mark question, the average mark was 1.54 for 51% of the available mark.

